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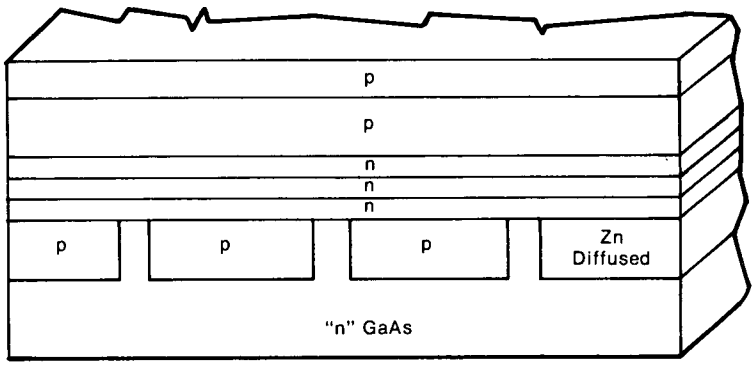
Formation of Internally-Confined Semiconductor Lasers



In a new technique for fabricating stripe lasers the current constriction is accomplished by diffusing blocking regions into the n-type substrate prior to growth. Rather than applying the constriction through or on the p-side, current flow is controlled by blocking layers, which results in the reduction of threshold current and better heat dissipation.

One of many methods used at present to make confined continuous-wave (CW) lasers is to deposit SiO on the surface of a wafer grown for CW applications. Photolithographic techniques are used to open up the SiO to form a stripe of desired width; then the material is processed with normal contacts. Thermal resistance is added to the diodes by the presence of the SiO film under the contacts adjacent to the stripe.

By using this method the material can be processed in the normal fashion after growth, eliminating the use of SiO on the surface and, thus, reducing thermal resistance. The process for obtaining a wafer for CW application, as illustrated, consists of the following steps:

a. The substrate to be grown on is appropriately masked with SiO, and the desired emitting width is achieved photolithographically. The stripes must be parallel to the <110> crystal plane to form, conveniently, the proper optical cavity.
b. The substrate is diffused with Zn under a predetermined time/temperature schedule.
c. The SiO is etched off.
d. The substrate is placed in a furnace, and the normal CW structure is grown.

The reversed-bias junction formed by growing an n layer on the Zn-diffused portions of the substrate restricts the current to flow only where the stripes are made. This provides the internal current confinement necessary to make a striped laser.

Note:

No further documentation is available. Specific questions, however, may be directed to:

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Patent status:

NASA has decided not to apply for a patent.

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Categories: 08 (Fabrication Technology)
03 (Physical Sciences)

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